

Long-Term Hydrologic Impact Assessment (L-THIA) - Microsoft Internet Explorer provided by Purdue University

Address: http://www.ecn.purdue.edu/runoffj

Local Government Environmental Assistance Network

HOT TOPICS | WHAT'S NEW? | REGULATORY INFORMATION | TOOLS & RESOURCES | CALENDAR

### Land Use Impacts on Water Quality

As local land use decisionmakers, municipal and county leaders regularly measure the benefits and costs of development proposals. In addition to factors such as the extension of existing infrastructure and the delivery of government services, local officials are beginning to consider the impact that land use changes will have on a community's water quality.

Land use changes can significantly impact groundwater recharge, stormwater drainage, and water pollution. The Long-Term Hydrologic Impact Assessment (L-THIA) model was developed as an accessible online tool to assess the water quality impacts of land use change. Based on community-specific climate data, L-THIA estimates changes in recharge, runoff, and nonpoint source pollution resulting from past or proposed development. As a quick and easy-to-use approach, L-THIA's results can be used to generate community awareness of potential long-term problems and to support planning aimed at minimizing disturbance of critical areas. L-THIA is an ideal tool to assist in the evaluation of potential effects of land use change and to identify the best location of a particular land use so as to have minimum impact on a community's natural environment.

**Basic L-THIA** | **Impervious L-THIA** | **GIS L-THIA**

Differences Between the Models

- **Basic L-THIA**

SEARCH / LGEAN CITY  
UPDATE SERVICE  
SITE MAP  
ASK LGEAN  
HOME

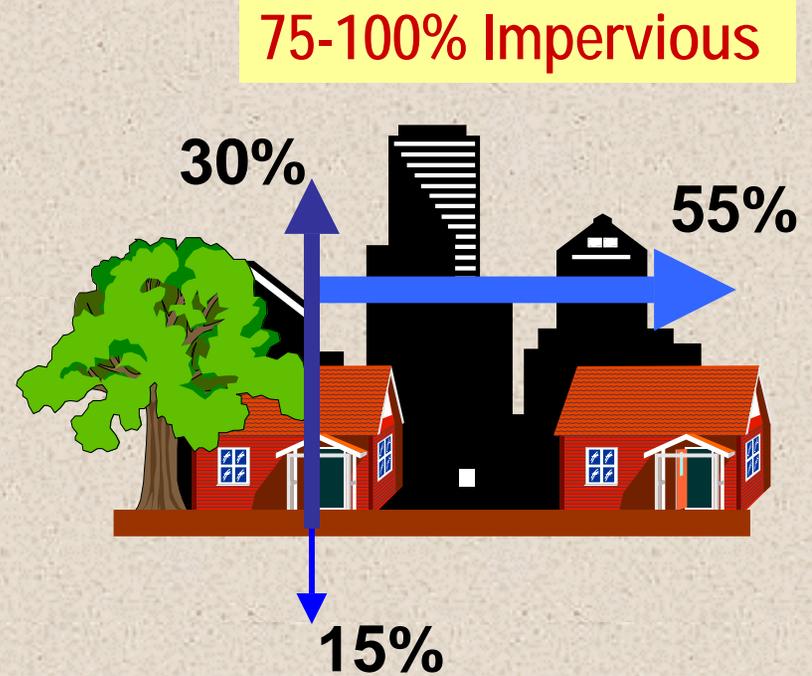
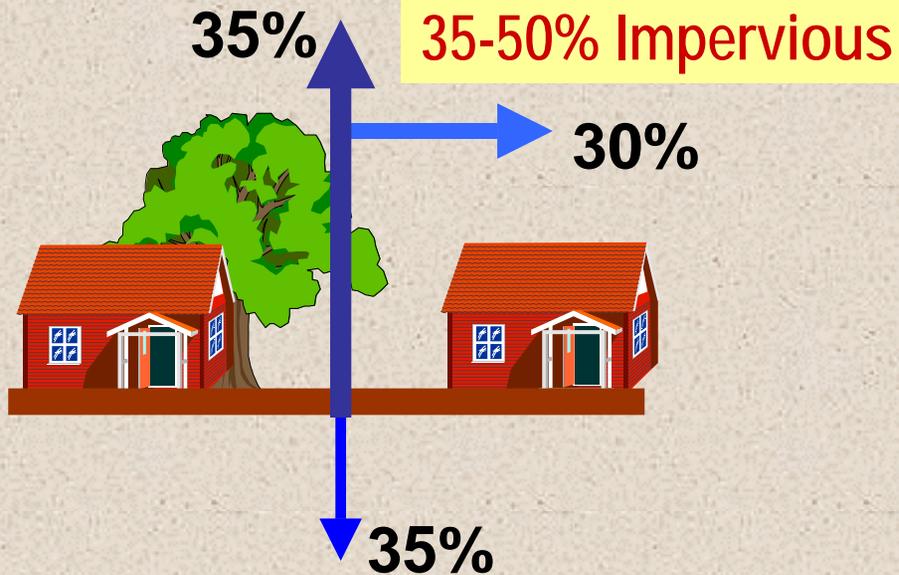
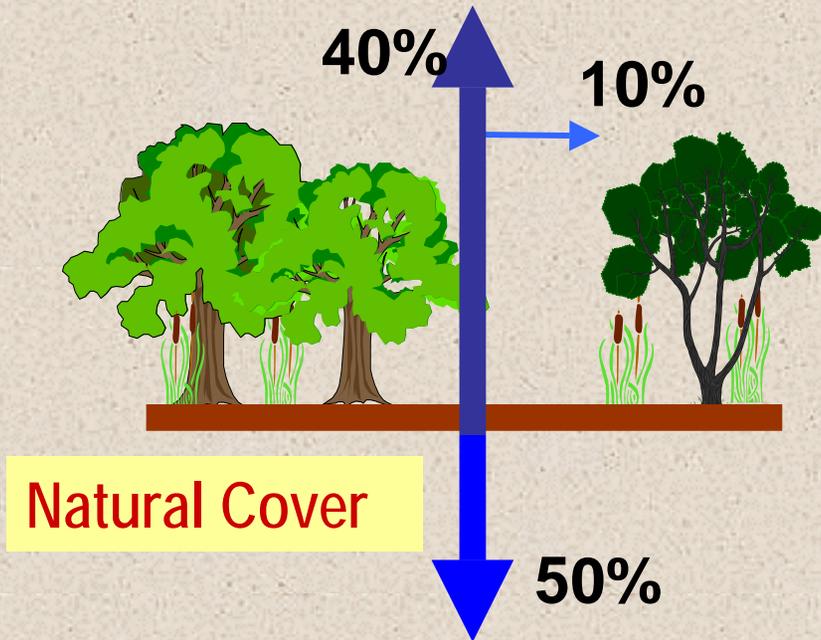
Internet

# *Introducing Web-Based Decision Tools for Environmental Management To Lake Michigan Communities*

Rich Zdanowicz &  
Alfred Krause

## Long-Term Hydrological Impact Assessment (L-THIA)

# Land Use Decisions Affect Runoff, Recharge, and Water Quality



**Rivers Drying Up  
Rivers Flooding  
Water Polluted**

**Stream Banks Eroding**

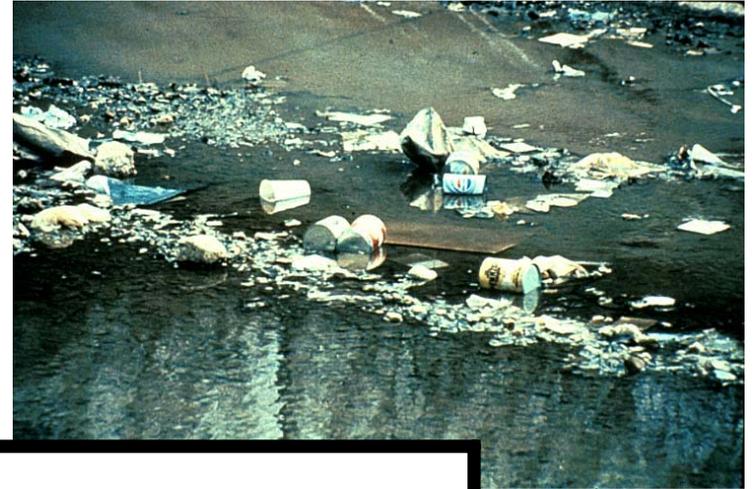
**Stream Ecology Changing**

**Wells Running Dry**

**Wetland Habitat Shrinking**



# Rivers Drying Up Rivers Flooding Water Polluted Str

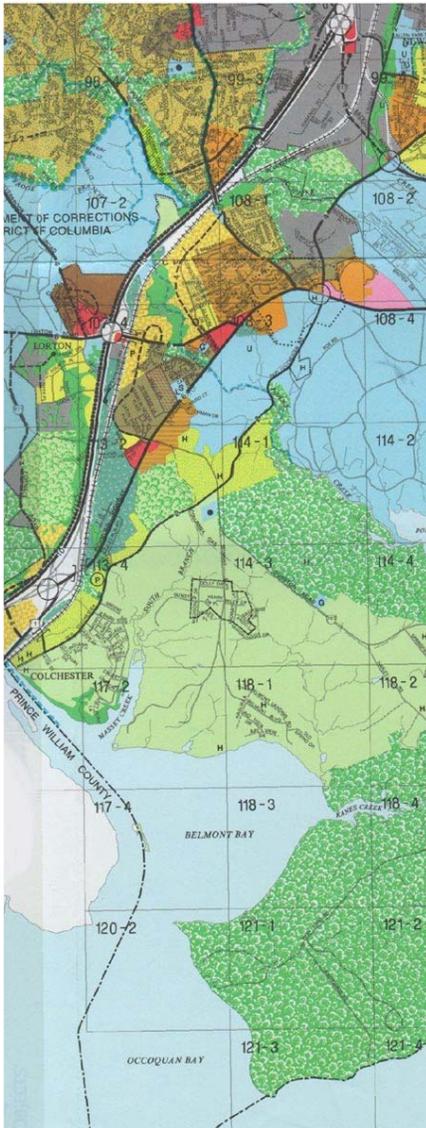


Most communities respond to this with a mix of reactive and proactive strategies, including planning

ry  
inking



# Planning

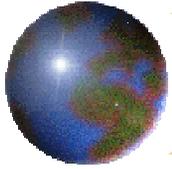


*The most important, large-scale, proactive step:*

*Where you do it can be just as important as what you do*

**Multifaceted – so how do you bring environmental concerns into this?**

**Impact Assessment Tools**



## *A little history....*

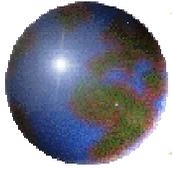
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**Northeast Ohio, 1992:** “Our wetlands are failing”

**Local Planners:** Need model to assess impact of land use change on hydrology.

**Reality:** Available models were data intensive and complex – and getting more so.

**The Aim:** To develop a user-friendly model using basic available data for land use and soils, in response to the needs of planners and local environmental groups.



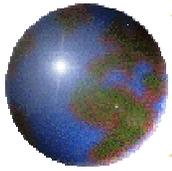
# *L-THIA*

Based on the rainfall – land cover – runoff analysis method already used in many communities

**Input:** Land Use Pattern(s) + Soils Pattern

**Process:** Daily Runoff and Pollutant Loading Calculations (30 years)

**Output:** Average Annual Runoff and NPS loads for Specific Land Use Patterns



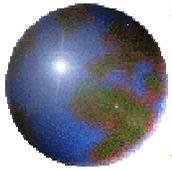
# L-THIA

The screenshot shows a web browser window titled "Long-Term Hydrologic Impact Assessment (L-THIA) - Microsoft Internet Explorer provided by Purdue University". The address bar shows "http://www.ecn.purdue.edu/runoff/". The page features a navigation menu with "HOT TOPICS", "WHAT'S NEW?", "REGULATORY INFORMATION", "TOOLS & RESOURCES", and "CALENDAR". A sidebar on the left contains icons for "SEARCH/LGEAN CITY", "UPDATE SERVICE", "SITE MAP", "ASK LGEAN", and "HOME". The main content area is titled "Land Use Impacts on Water Quality" and includes a red hand icon. The text describes the L-THIA model and its use in assessing water quality impacts. Below the text are three small images representing different L-THIA models: "Basic L-THIA", "Impervious L-THIA", and "GIS L-THIA". At the bottom, there are links for "Background Information", "FAQ", and "Comments or Question".

Originally a simple spreadsheet program

Now a simple web tool

GIS extension version also available



# Large-Scale Implementation

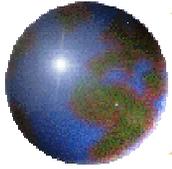
- - ICMA (International City/County Management Association)

The image displays three screenshots of the L-THIA website interface, illustrating the user experience from navigation to the basic model tool.

**Left Screenshot: Local Government Assistance Network - LGEAN**  
This screenshot shows the main navigation page. It features the ICMA logo and the LGEAN logo. A vertical sidebar on the left contains navigation icons for: ABOUT LGEAN, LGEAN PARTNERS, ASK LGEAN, UPDATE SERVICE, SITE MAP, and SEARCH/LGEAN CITY. The main content area includes a large graphic with sunflowers and the text "Local Government Environmental Assistance Network" and "EPA Changes NSR Rules". At the bottom, there are logos for the Water Environment Federation, NACo, PERI, and the Air & Waste Management Association.

**Middle Screenshot: Land Use Impacts on Water Quality**  
This screenshot shows the "Land Use Impacts on Water Quality" page. It features a navigation menu at the top with categories: HOT TOPICS, WHAT'S NEW?, REGULATORY INFORMATION, TOOLS & RESOURCES, and CALENDAR. The main content area includes a hand icon and the title "Land Use Impacts on Water Quality". The text explains that as local land use decisionmakers, municipal and county leaders regularly measure benefits and costs of development proposals. It also states that land use changes can significantly impact groundwater recharge, stormwater runoff, and nonpoint source pollution. Below the text are three small images labeled "Basic L-THIA", "Impervious L-THIA", and "GIS L-THIA". A sidebar on the left contains navigation icons for SEARCH/LGEAN CITY, UPDATE SERVICE, SITE MAP, ASK LGEAN, and HOME.

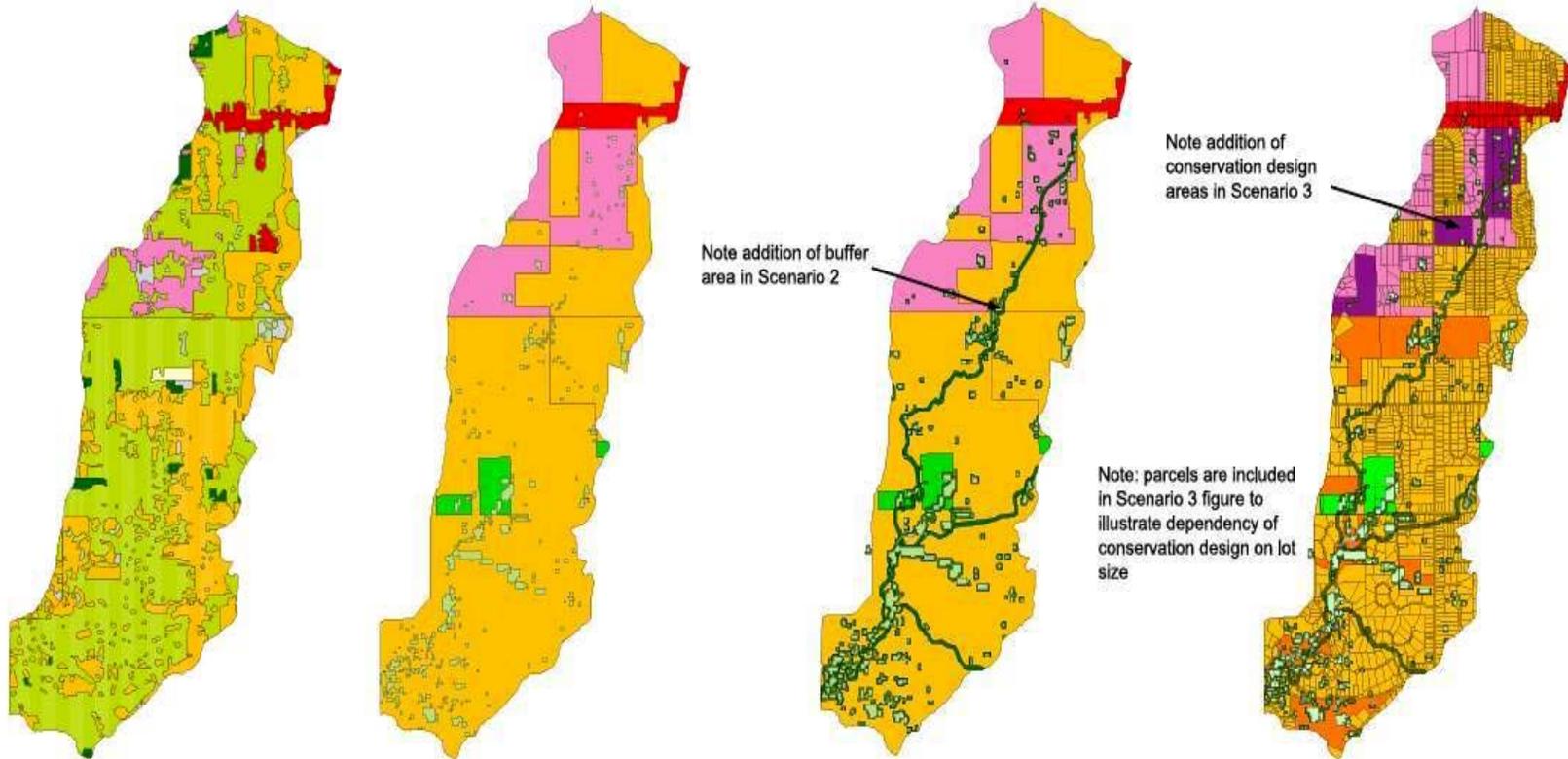
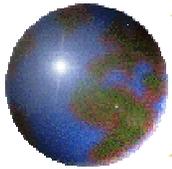
**Right Screenshot: L-THIA Basic Model**  
This screenshot shows the "L-THIA Basic Model" tool. It features a navigation menu at the top with categories: TOPICS, NEW INFORMATION, and RESOURCES. The main content area includes a hand icon and the title "L-THIA Basic Model". Below the title are tabs for Introduction, Location, Land Use Change, Results, and Interpreting the Results. The "Land Use Change Scenarios" section explains that users must identify the current land use for a specific area and describe up to two land use change scenarios. It includes a form for entering the area (in acres) and a table for selecting land use, soil type, and area for each scenario. The table has columns for "Land Use", "Soil Type", "Area", "Current", "Scenario 1", and "Scenario 2". The "Area" column is currently set to "0". Below the table are buttons for "L-THIA Home", "Previous", and "Next".



## *Example Applications of L-THIA*

### Impacts Assessment for:

- proposed land use change and wetland hydrology.
- residents downstream of a proposed land use change.
- tourism / agriculture transition impacts on a coastal watershed, Barbados.
- past and future land use change in an urban-rural fringe watershed, including impact fee assessment.
- Watershed scale implications of land use change for NPS pollution



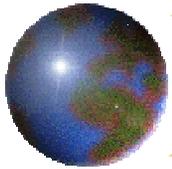
Note addition of buffer area in Scenario 2

Note addition of conservation design areas in Scenario 3

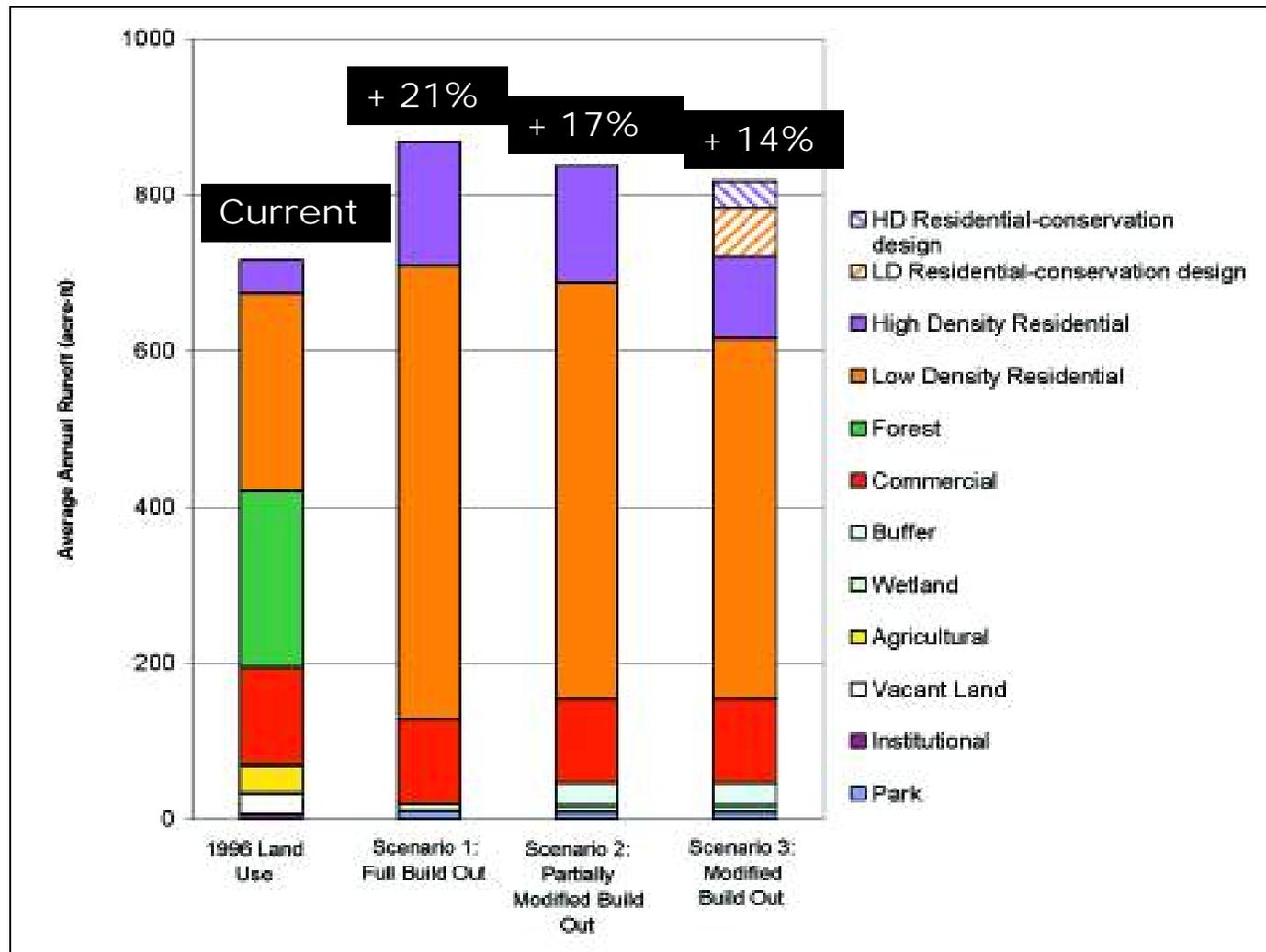
Note: parcels are included in Scenario 3 figure to illustrate dependency of conservation design on lot size

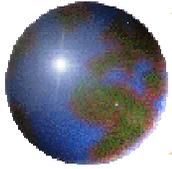
Example: Chagrin River Watershed Partners, Griswold Creek Watershed

Land Use	
	Agriculture
	Forest
	Wetland
	Industrial
	Wetland/Riparian Buffer
	Commercial
	Institutional
	High Density Residential
	Low Density Residential
	HD Residential-conservation design
	LD Residential-conservation design
	Vacant land



*Proposed approaches would reduce but not eliminate the impact*





# So how do you do it?

- L-THIA Web

Long-Term Hydrologic Impact Assessment (L-THIA) - Microsoft Internet Explorer provided by Purdue University

Address: <http://www.ecn.purdue.edu/runoff/>

Local Government Environmental Assistance Network

HOT TOPICS | WHAT'S NEW? | REGULATORY INFORMATION | TOOLS & RESOURCES | CALENDAR

## Land Use Impacts on Water Quality

As local land use decisionmakers, municipal and county leaders regularly measure the benefits and costs of development proposals. In addition to factors such as the extension of existing infrastructure and the delivery of government services, local officials are beginning to consider the impact that land use changes will have on a community's water quality.

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Basic L-THIA | Impervious L-THIA | GIS L-THIA

Differences Between the Models

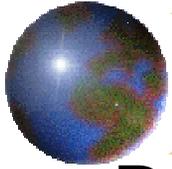
- [GIS L-THIA](#)  
Enables users to download an ArcView GIS version of L-THIA for PCs.
- [Related Tools](#)  
Other tools from the developers of L-THIA

[Background Information](#)

[FAQ](#)

[Comments or Question](#)

<http://www.ecn.purdue.edu/runoff/lthianew>



# Run L-THIA from Text Input form

**Step One**

**Step Two**

**Step Three**

**Land Use Change Scenarios**

Users must identify the current land use for a specific area, and can describe up to two land use change scenarios. Users can select as many land use descriptions as necessary to describe the current land use or land use change scenarios. Users must also describe each land use description's size and soil type. Size can be entered in either acres, square miles, hectares, or square kilometers. If unknown, soil types can be determined using the link below to search GIS maps of your region. Help is available by clicking on any of the question mark icons. **(Important:** The total area of the current land use and each of the land use change scenarios must be equal before L-THIA can run.)

Area will be entered in:  [View Completed Sample](#)

Land Use ?	Soil Type ?	Area ?		
		Current	Scenario 1	Scenario 2
(Use as many as necessary)	<a href="#">Check Map</a>			
Commercial	B	10	80	
Industrial	B	20	70	
High Density Residential	C			
Low Density Residential	B			
Grass/Pasture	C			
Agricultural	C	180	50	
Forest	B	200	90	
SELECT LAND USE	A			
SELECT LAND USE	A			
Total Area:		590	590	0

**Annotations:**

- State
- County
- Land use and hydrologic soil group selection
- Area input
- Click Next

# Tables and charts for interpretation



## L-THIA Basic Model

- Introduction
- Location
- Land Use Change
- Results**
- Interpreting the Results

### Step Four

#### Runoff and Nonpoint Source Pollutant Results

Based on the information provided (see Summary of Scenarios), L-THIA estimates the following rates of runoff volume, runoff depth, and nonpoint source pollutants. Results can also be viewed in comparative bar graphs and pie charts by using the pull-down menus located at the top-left of each table.

Go to:  [Print Results](#) [Download Results](#)

**SUMMARY OF SCENARIOS**  
 State: Michigan  
 County: Muskegon

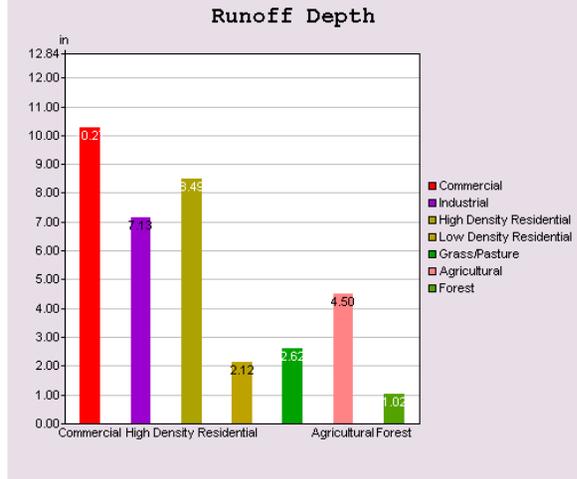
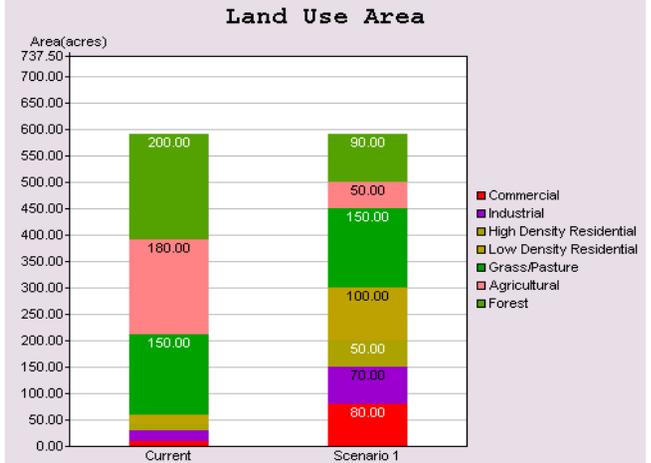
View as:

Land Use	Hydrologic Soil Group	Current	Scenario 1	Scenario 2
Commercial	B	10	80	0
Industrial	B	20	70	0
High Density Residential	C	10	50	0
Low Density Residential	B	20	100	0
Grass/Pasture	C	150	150	0
Agricultural	C	180	50	0
Forest	B	200	90	0

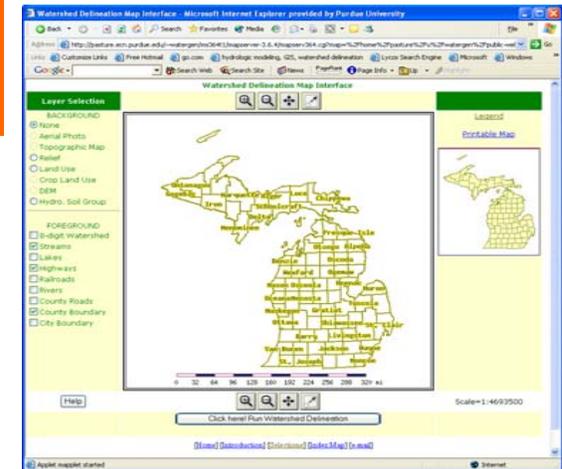
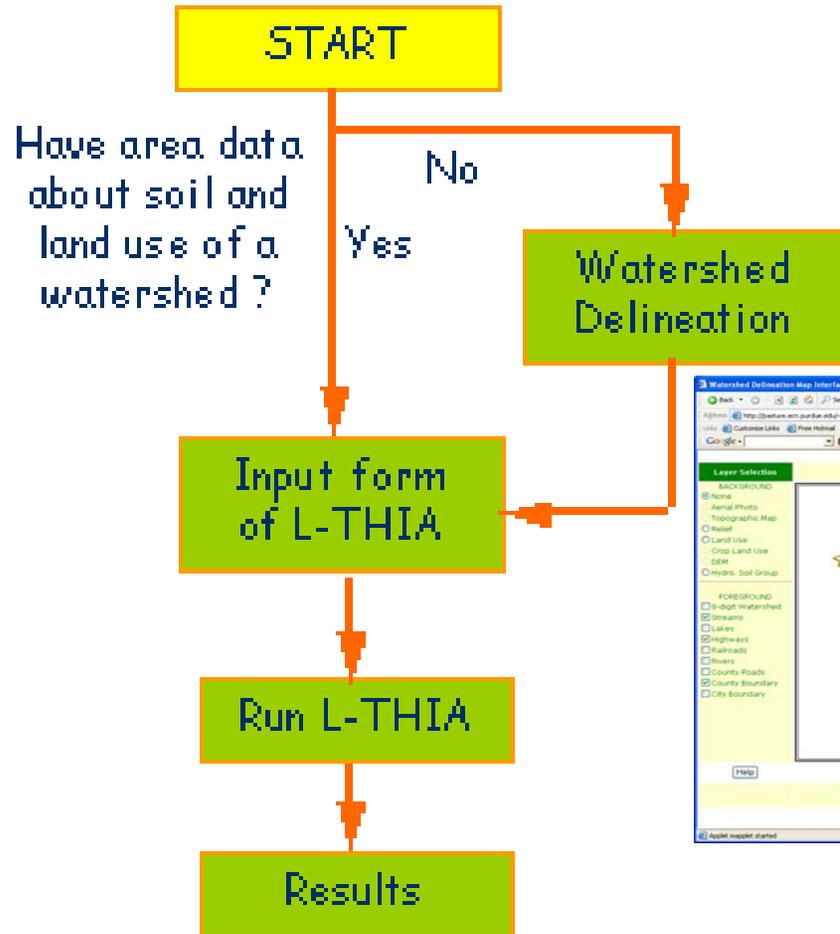
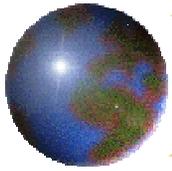
**RUNOFF RESULTS**  
 Avg. Annual Runoff Volume (acre-ft)

View as:

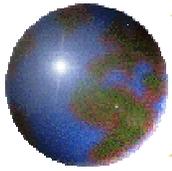
Land Use	Current	Scenario 1	Scenario 2
Commercial	8.52	68.19	0
Industrial	11.83	41.42	0
High Density Residential	7.04	35.23	0
Low Density Residential	3.51	17.59	0
Grass/Pasture	32.61	32.61	0
Agricultural	67.23	18.67	0
Forest	16.93	7.61	0



[Close](#) [Print Results](#)



**What if I don't have Land Use and Soils Data?**



Web - Microsoft Internet Explorer provided by Purdue University

Address: <http://pasture.ecn.purdue.edu/~watergen/>

Click Here

**HYMAPS-OWL**  
 Online Watershed Delineation: Web-GIS tools for Spatial Hydrologic Analysis

**L-THIA**  
 Long-Term Hydrologic Impact Assessment

**ICMA**  
 International City/County Management Association  
 LGEAN: L-THIA

**Short-term Runoff Tools**  
 Sediment and Erosion Control Planning, Design and Specification Information

**Wellhead Protection Area**  
 Web-based Wellhead Protection Area Defining Tool

**WWW-NAPRA**  
 Web-based National Agricultural Pesticide Risk Analysis

**CAAGIS**  
 Center for Advanced Applications in GIS, Ag. and Bio. Engineering, Purdue University

**Urban BMPs**  
 Web-based Preliminary Tool for Total Maximum Daily Loading

**PURDUE UNIVERSITY**  
**PURDUE UNIVERSITY**  
 AGRICULTURAL AND BIOLOGICAL ENGINEERING

For more information, please Contact Bernard A. Engel and Jin-Yong Choi

http://pasture.ecn.purdue.edu/~jychoi/wd\_home/Sele0.htm - Microsoft Internet Explorer

Address: [http://pasture.ecn.purdue.edu/~jychoi/wd\\_home/Sele0.htm](http://pasture.ecn.purdue.edu/~jychoi/wd_home/Sele0.htm)

Web-GIS - Online Watershed Delineation - Online Digitizing

For online watershed delineation, hydrologic data preparation and online digitizing, click here to enter land use in the watershed information browser.

CLICK HERE

For online digitizing and hydrologic data extraction for digitized area. You can use and hydrologic soil group information for any area you draw using online digitizing applet in Indiana, USA, in real time within your WWW browser.

CLICK HERE

Fort Bragg (MapServer interface), Hoke and Cumberland County, North Carolina includes aerial photographs, land use, DEM and other geographical information

Once you have obtained a watershed using watershed delineator and online digitizing tool you can:

- \* Estimation of impervious area of your watershed
- \* Run L-THIA (Long-Term Hydrologic Impact Assessment) model for runoff and source pollution loading
- \* Run SedSpec (Sediment and Erosion Control Planning, Design and Specification Information and Guidance Tool)
- \* After processing, you can also download the watershed boundary, land use and hydrologic soil group maps onto your computer, and use with desktop GIS tools ArcView. (Refer to the download page)

Programmed by Jin-Yong Choi & Bernard A. Engel, and data supported by Larry Theller, CAAGIS (Center for Advanced Application of GIS)  
 Agricultural & Biological Engineering Department, Purdue University  
 ABE Bldg. 225 S. University Street, West Lafayette, IN 47907-2064  
 This tools have been developed with support from USEPA, USDA and US Army

[Home][Introduction][Selections][e-mail]

Select your state - Microsoft Internet Explorer provided by Purdue University

Address: [http://pasture.ecn.purdue.edu/~watergen/owls/htmls/select\\_your\\_state.htm](http://pasture.ecn.purdue.edu/~watergen/owls/htmls/select_your_state.htm)

Select your state

Indiana

Illinois : This is a trial version.

Ohio : This is a trial version.

Wisconsin : This is a trial version.

Michigan : This is a trial version.

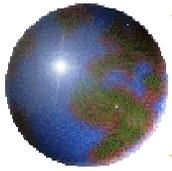
Minnesota is under processing and will be added.

Programmed by Bernard A. Engel and Jin-Yong Choi.

Data processed and prepared by Larry Theller in CAAGIS (Center for Advanced Applications of GIS)

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*<http://pasture.ecn.purdue.edu/~watergen>*



**Watershed Delineation Map Interface - Microsoft Internet Explorer provided by Purdue University**

Address: <http://pasture.ecn.purdue.edu/~watergen/ms364t1/mapserver-3.6.4/mapserv364.cgi?map=%2FHome%2Fpasture%2Fu%2Fwatergen%2Fpublic-wel>

**Watershed Delineation Map Interface**

**Layer Selection**

**BACKGROUND**

- None
- Aerial Photo
- Topographic Map
- Relief
- Land Use
- Crop Land Use
- DEM
- Hydro. Soil Group

**FOREGROUND**

- 8-digit Watershed
- Streams
- Lakes
- Highways
- Railroads
- Rivers
- County Roads
- County Boundary
- City Boundary

**Map Display**

**Legend**

[Printable Map](#)

**Reference Map**

**Display Control**

Zoom in/out  
Pan, Full extent

**WD Submit Button**

Click here! Run Watershed Delineation

[Home](#) [Introduction](#) [Selections](#) [Index Map](#) [e-mail](#)

Scale=1:4693500

Applet mapplet started

Layer Control On/Off

Display Control Zoom in/out Pan, Full extent

WD Submit Button

# Watershed Delineation: Muskegon County, MI

The image displays three screenshots of the Watershed Delineation Map Interface, a web-based application for watershed analysis. The interface is titled "Watershed Delineation Map Interface" and is provided by Purdue University. It features a "Layer Selection" panel on the left, a "Legend" panel on the right, and a main map area. The "Layer Selection" panel includes options for "BACKGROUND" (None, Aerial Photo, Topographic Map, Relief, Land Use, Crop Land Use, DEM, Hydro. Soil Group) and "FOREGROUND" (8-digit Watershed, Streams, Lakes, Highways, Railroads, Rivers, County Roads, County Boundary, City Boundary). The "Legend" panel includes a "Printable Map" link and a small map of Michigan. The main map area shows a watershed delineation for Muskegon County, MI, with a scale of 1:28800. A red arrow points to a blue circle on the map, indicating the selected outlet point. The interface also includes a "Click here! Run Watershed Delineation" button and a footer with links for [Home], [Introduction], [Selections], [Index Map], and [e-mail].

Outlet point selected

# Watershed Delineation: Muskegon County, MI

## Results Page

Queried results for spatial data

Watershed Area (acres)	Soil group	Area(acres)
Land use		
Water	A	28.6
Water	C	22.2
Agriculture	A	25.6
Agriculture	C	3.4
LD-Residential	A	27.6
LD-Residential	C	5.4
Grass/Pasture	A	206.2
Grass/Pasture	C	22.7
Forest	A	663.1
Forest	C	319.3
Total Area		1324.6

Watershed maps

If you want to review the maps extracted, click here to change land use in your watershed and to see the Mapserver GIS display

If you want to download the maps extracted, click link below

[Download Page](#)

Land use and Hydrologic Soil Group data were prepared, so you can conduct long-term hydrologic impact analysis (L-THIA) for the watershed. Click the button named "Data preparation and run L-THIA", and a completed L-THIA form for running the L-THIA model will be displayed. In a similar manner, you can estimate peak runoff rate from the watershed using SEDSPEC. You can also estimate the amount of impervious area in your watershed.

Calculate watershed % of Impervious area

Data preparation and Run L-THIA

Run SEDSPEC for Erosion Control Structures Design

Run Peak Runoff Estimation using SEDSPEC

## Result display

Watershed Delineation Map Interface

Layer Selection

- BACKGROUND
  - None
  - Aerial Photo
  - Topographic Map
  - Relief
  - Land Use
  - Crop Land Use
  - DEM
  - Hydro. Soil Group
- FOREGROUND
  - 8-digit Watershed
  - Streams
  - Lakes
  - Highways
  - Railroads
  - Rivers
  - County Roads
  - County boundary

Output Layers

- Watershed Boundary
- None
- Land Use
- Hydro. Soil Group
- Curve Number Map

Legend

[Printable Map](#)

[Download Page](#)

[Index Map](#)

[Run Hydrologic Models](#)

Map showing Watershed Boundary, Streams, Lakes, Highways, Rivers, County Roads, and County boundary.

Map showing Watershed Boundary, Streams, Lakes, Highways, Rivers, County Roads, and County boundary.

Scale=1:30700

Click here! Run Watershed Delineation

Online digitizing to change land use in your watershed

## Run hydrologic models

- Impervious Area
- L-THIA
- SEDSPEC
- Peak Runoff Estimation

# Run L-THIA : Muskegon County, MI

### Queried results for spatial data

Watershed Area (acres)	Soil group
Land use	A
Water	C
Water	C
Agriculture	A
Agriculture	C
LD-Residential	A
LD-Residential	C
Grass/Pasture	A
Grass/Pasture	C
Forest	A
Forest	C
Total Area	

Watershed maps If you want to review the maps extracted

[click here to change land use in your watershed](#)  
[the Mapserver GIS display](#)

If you want to download the maps extracted below

[Download Page](#)

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Calculate watershed % of Impervious area

Data preparation and Run L-THIA

Run SEDSPEC for Erosion Control Structures Design

Run Peak Runoff Estimation using SEDSPEC

### L-THIA Basic Input

- Name to identify output:
- State:
- County:
- Area in:

LAND USE	HYD. SOIL GROUP	1	2	3
		SCENARIO 1	SCENARIO 2	SCENARIO 3
Water/Wetlands	A	28.6		
Water/Wetlands	C	22.2		
Agricultural	A	25.6		
Agricultural	C	3.4		
Low Density Residential	A	27.6		
Low Density Residential	C	5.4		
Grass/Pasture	A	206.2		
Grass/Pasture	C	22.7		
Forest	A	663.1		
Forest	C	319.3		
SELECT LANDUSE	A			
SELECT LANDUSE	A			
				0

[Back to Watershed Delineation](#)

Data Preparation and Run L-THIA

# Run L-THIA : Muskegon County, MI

## Tables and charts for interpretation

L-THIA output - Microsoft Internet Explorer provided by Purdue University

Address: <http://pasture.ecn.purdue>

### L-THIA OUTPUT

Scenario Name : wdcjy12859  
 Total area : 13246 acres  
 State : Michigan  
 County : Muskegon

Link To [GIS RAINFALL DATA](#) Text File

#### Average Annual Runoff Volume for SCENARIO 1

Land Use	Hydrologic Soil Group	Area (acres)	Average Annual Runoff Volume (acre-ft)
Water/Wetlands	A	28.6	0
Water/Wetlands	C	22.2	0
Agricultural	A	25.6	3.29
Agricultural	C	3.4	1.26
Low Density Residential	C	27.6	2.22
Low Density Residential	C	5.4	1.75
Grass/Pasture	A	206.2	8.89
Grass/Pasture	C	22.7	4.93
Forest	A	663.1	16.51
Forest	C	319.3	56.18
<b>Total Annual Volume (acre-ft)</b>			<b>95.07</b>
<b>Average Annual Runoff Depth (in)</b>			<b>0.86</b>

#### Average Runoff Depth For Hydrologic Soil Group And Landuse Combination

Land Use	Hydrologic Soil Group	Curve Number	Runoff Depth (in)
Water/Wetlands	A	0	0
Water/Wetlands	C	0	0
Agricultural	A	64	1.55
Agricultural	C	82	4.5
Low Density Residential	A	54	0.97
Low Density Residential	C	80	3.92
Grass/Pasture	A	70	1.52

Navigation menu: Home, Documentation, L-THIA, Basic Input, Detailed Input, Advanced Input, Impervious Input, Reload Data, Previous Results, Save Output, Output, Runoff NPS, What (Nitrogen, Phosphorous, Suspended Solids, Lead, Copper, Zinc, Cadmium, Chromium, Nickel, BOD, COD, Oil and Grease, Fecal Coliform, Fecal Streps)

### Runoff Depth

Land Use	Runoff Depth (in)
Water/Wetlands	0
Agricultural	1.55
Grass/Pasture	4.5
Forest	1.52

### Average Annual Nitrogen Losses in lbs

Land Use	Nitrogen Loss (lbs)
Water/Wetlands	0
Agricultural	15,000
Low Density Residential	39,000
Grass/Pasture	17,000
Forest	37,000
<b>Total</b>	<b>108,000</b>

Buttons: Close, Print Results

# On-line Digitizing Tool: Indian Creek, Tippecanoe County, Indiana

## Land Use Change Using On-line Digitizing Tool and Run L-THIA

The screenshot displays the L-THIA web application interface. On the left, the 'Online Web-GIS Digitizing Tool' is active, showing a map of Tippecanoe County, Indiana, with various land use features highlighted. A 'Summary' window is overlaid on the map, listing digitized areas with their serial numbers, areas in square kilometers, land use types, and colors.

Serial No.	Area sq. km	Land Use	Color
1	0.045852239462399115	Commercial	Red
2	0.0620214976511988	High Density Residential	Orange
3	0.18364500541439643	Low Density Residential	Yellow
4	0.10557227335679796	Industrial	Brown

On the right, the 'Queried results for spatial data' window displays three tables of land use data. The first table shows data before digitizing, the second shows data inside the watershed after digitizing, and the third shows data outside the watershed after digitizing.

Land use data before digitizing		
Land use	Soil group	Area(acres)
Agriculture	B	140
Agriculture	C	179.3
Grass/Pasture	B	5.1
Grass/Pasture	C	5.4
Forest	B	0.9
Forest	C	0.2
Total Area		330.9

Land use data inside the watershed after digitizing		
Land use	Soil group	Area(acres)
Commercial	B	12.1
Agriculture	B	139
Agriculture	C	118.3
HD-Residential	C	17.2
LD-Residential	C	24.9
Grass/Pasture	B	3.7
Grass/Pasture	C	1.7
Forest	B	0.7
Forest	C	0.2
Industrial	C	12.8
Total Area		330.9

Land use data outside the watershed after digitizing		
Land use	Soil group	Area(acres)
HD-Residential	C	5.1
LD-Residential	C	25.9
Industrial	C	18
Total Area		49.1

At the bottom, a large text box reads: 'Land Use Change Report after Digitizing'. Below this, there are buttons for 'Calculate watershed % of Impervious area' and 'Data preparation and Run L-THIA'.

# Run L-THIA : Muskegon County, MI

But What do the Numbers Mean?

More Information - Microsoft Internet Explorer provided by Purdue University

Address <http://www.ecn.purdue.edu/runoff/> Go Links

## What Can I Do?

Strategic Land Use Management Techniques to Minimize the Impact of Change <a href="#">Learn more</a>	Analyzing Results <ul style="list-style-type: none"><li>• Retrieving output from past model runs</li><li>• <a href="#">Interpreting model results</a></li><li>• <a href="#">Case Studies</a></li></ul>
<a href="#">Definition and Cost Estimates of Urban Best Management Practices</a>	

Home  
Documentation  
L-THIA  
Basic Input  
Detailed Input  
Previous Results

Internet





# SEDSPEC

*<http://pasture.ecn.purdue.edu/~sedspec>*

Short-term Runoff Tools - Microsoft Internet Explorer provided by Purdue University

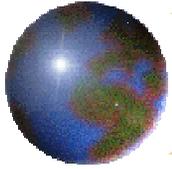
Address <http://danpatch.ecn.purdue.edu/~sedspec/> Go Links Google

## Short-term Runoff Tools



- **SedSpec**  
SedSpec is an expert system that will assist you in analyzing runoff and erosion problems on your site by determining the peak rate of runoff from the area. The analysis will provide information about different types of runoff and erosion control structures.
- **Rational Method**  
The Rational Method is a simple method of predicting the peak rate of runoff. It is an oversimplification of the complicated runoff process, but it is considered accurate enough for runoff estimation in the design of relatively inexpensive structures where the consequences of failure are limited (i.e., failure will not result in loss of life). This tool returns the peak rate of runoff, the depth of runoff (computed using the SCS CN method), the computed time of concentration (using the Kirplich formula), and the corresponding rainfall depth.
- **TR-55**  
Technical Release 55 (TR-55) presents simplified procedures for estimating runoff and peak discharges in small watersheds. While this TR gives special emphasis to urban and urbanizing watersheds, the procedures apply to any small watershed in which certain limitations are met. This tool will return the peak rate of runoff, the depth of runoff (computed using the SCS CN method).
- **Database Frontend**  
Here you can retrieve rainfall depths from the databases used by SedSpec. You can choose between Technical Paper 40

Done Internet



# *Input for Area, HSG, and Land use*

**Design Runoff Rate Calculation  
(Rational Method)**

---

Select the units of area:

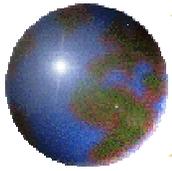
Area	Hydrological Soil Group <a href="#">State Soil Map</a>	Land Use	Level of Use
<input type="text" value="40"/>	<input type="text" value="B"/>	<input type="text" value="Grass/Forest Combination"/>	<input type="text" value="Heavy"/>
<input type="text"/>	<input type="text" value="A"/>	<input type="text" value="Forest"/>	<input type="text" value="Heavy"/>
<input type="text"/>	<input type="text" value="A"/>	<input type="text" value="Forest"/>	<input type="text" value="Heavy"/>
<input type="text"/>	<input type="text" value="A"/>	<input type="text" value="Forest"/>	<input type="text" value="Heavy"/>
<input type="text"/>	<input type="text" value="A"/>	<input type="text" value="Forest"/>	<input type="text" value="Heavy"/>

Check if you have more hydrological areas in your watershed.

Check if you would like to provide your own rainfall depth (Leave unchecked if you would rather use data from TP-40).

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[Comments](#)  
[Glossary](#)

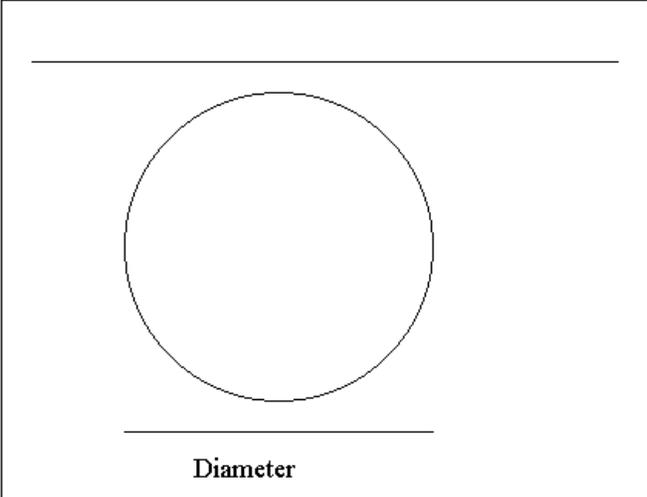


*This is how a culvert design is presented. The applet provides the user the opportunity to change the number of culverts. Cost and size change accordingly.*

## Culvert Dimensions

Your site requires 1 culverts of the diameter given below.

Culvert diameter:  inches  
Number of Culverts:

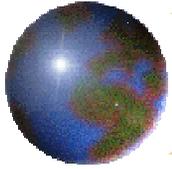


Diameter

To solve your erosion problem, you need culvert(s) of the above size. If you would like to see the difference more culverts would make on the size, select a different number from the drop down menu above.

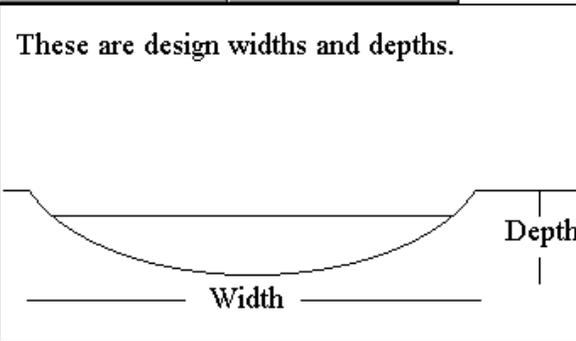
*Do not build anything on the above drawing. It is only an approximation. Contact a qualified engineer for detailed drawings and specifications.*

[Return to Possible Engineering Practices](#)



## Grass Lined Channel Dimensions

Channel width	<input type="text" value="18"/>	feet
Channel depth	<input type="text" value="2"/>	feet
Increase Width	Increase Depth	
Decrease Width	Decrease Depth	

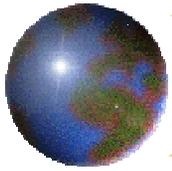


*Buttons allow  
the user to  
change  
dimensions.*

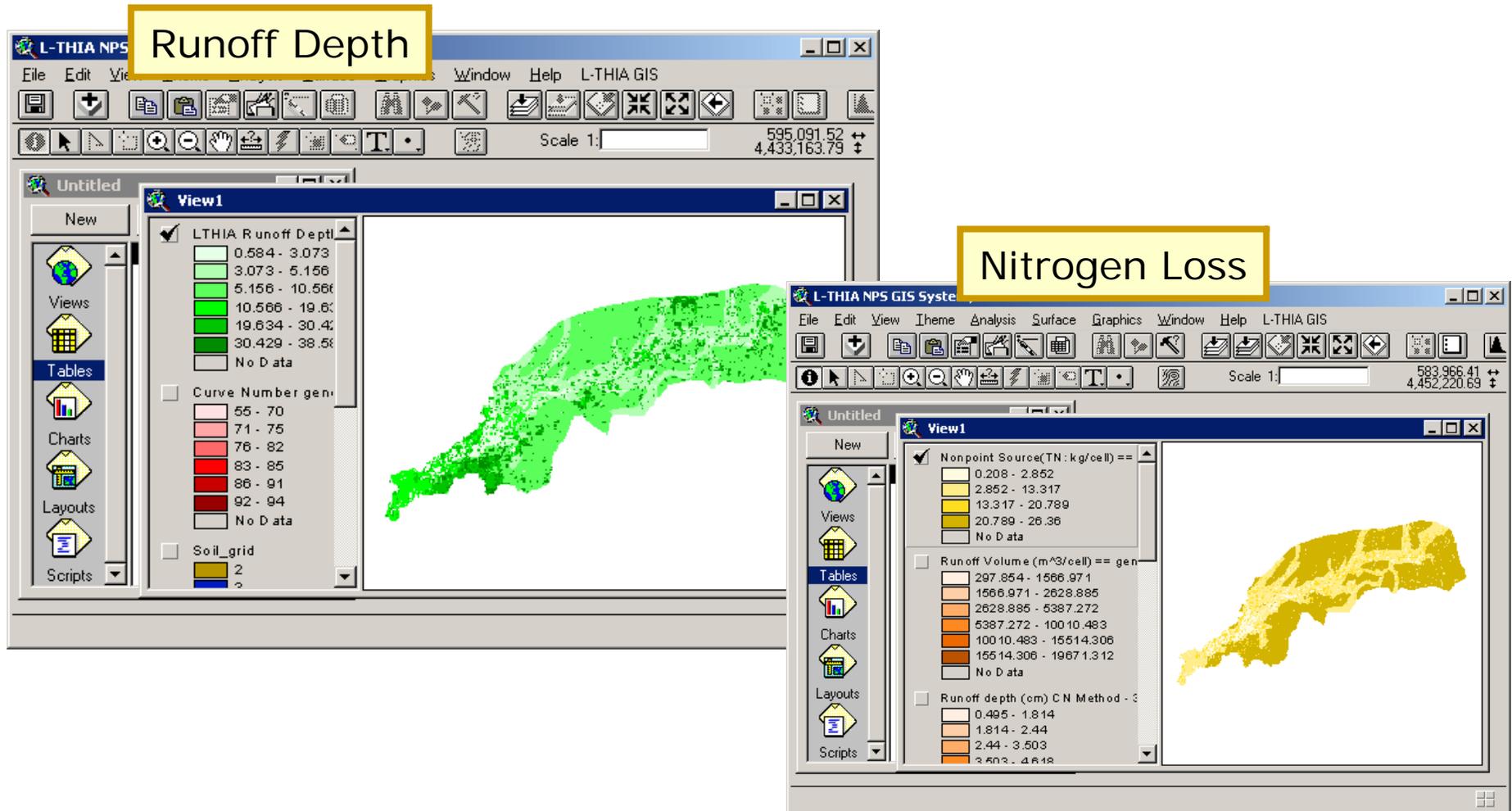
Construction of a grass lined channel similar in size to the one above will help solve your erosion problem. The drawing above is based on information pertaining to your site. The dimensions were calculated from rainfall and topographical information of the site. This drawing should give you a rough idea on how large a grass lined channel you will need.

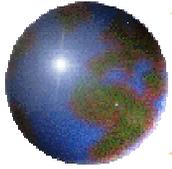
*Do not build anything based on the drawing. You need to contact a local contractor or engineering firm to get construction quality blueprints.*

[Return to Possible Engineering Practices](#)



# *L-THIA GIS Predicted Results*





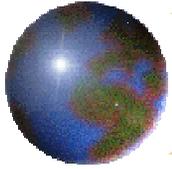
## Important Questions

(we know they are important because.....)

**Cost**: There is no software or site access cost. \$0, honest!

**Knowledge / Technical Expertise**: Basic Version: Middle school teachers use this with their students.

**Data**: Basic data for IN, IL, OH, MI, and WI is online – you can start with nothing. You can use your own data and customize the tool.

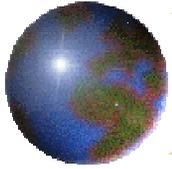


## Important Questions

**Staff**: No commitment for user

**Platform**: Basic Version: Internet Access. You can run a GIS version if you like

**Validity**: Consistent with empirical data and other models. Accuracy increases with local calibration.

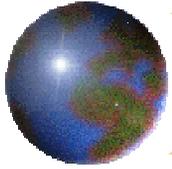


## Important Questions

**Transparency**: If you've forgotten, it's explained at the web site

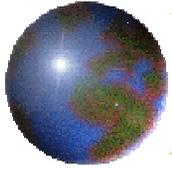
**Understandability**: Tool produces average annual runoff and pollutant loadings for each land use decision.

**Scope**: Can be used at site or broad scale, but should be used at the scale of the land use decision.



## *How is L-THIA Used?*

- Near Columbus, OH – significance of urbanization on runoff and water quality
- Triangle Park, NC – comprehensive land use plan
- NASA KSC, FL – impacts of historical land use change
- Northeast OH – land use planning policy assessment
- Indianapolis, IN – historical impacts
- Kokomo, IN – TMDL development



Long-Term Hydrologic Impact Assessment (L-THIA) - Microsoft Internet Explorer provided by Purdue University

Address: <http://www.ecn.purdue.edu/runoff/>

Local Government Environmental Assistance Network

HOT TOPICS	WHAT'S NEW?	REGULATORY INFORMATION	TOOLS & RESOURCES	CALENDAR
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### Land Use Impacts on Water Quality

As local land use decisionmakers, municipal and county leaders regularly measure the benefits and costs of development proposals. In addition to factors such as the extension of existing infrastructure and the delivery of government services, local officials are beginning to consider the impact that land use changes will have on a community's water quality.

Land use changes can significantly impact groundwater recharge, stormwater drainage, and water pollution. The Long-Term Hydrologic Impact Assessment (L-THIA) model was developed as an accessible online tool to assess the water quality impacts of land use change. Based on community-specific climate data, L-THIA estimates changes in recharge, runoff, and nonpoint source pollution resulting from past or proposed development. As a quick and easy-to-use approach, L-THIA's results can be used to generate community awareness of potential long-term problems and to support planning aimed at minimizing disturbance of critical areas. L-THIA is an ideal tool to assist in the evaluation of potential effects of land use change and to identify the best location of a particular land use so as to have minimum impact on a community's natural environment.



**Basic L-THIA**      **Impervious L-THIA**      **GIS L-THIA**

**Differences Between the Models**

- Basic L-THIA**  
Users only need to input their location, soil type, and the type of land use change taking place.

## Changing Landscapes: Anticipating the effects of local land use decisions.

Long-Term Hydrological Impact Assessment  
(L-THIA)  
<http://www.ecn.purdue.edu/runoff/lthianew>